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COMMON SYSTEMS

SYSTEM STATUS PANEL RELAY
CIRCUIT

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SECTION I - GENERAL DESCRIPTION1. PURPOSE OF CIRCUIT

1.01 The system status panel relay (SSPK) unit provides a relay interface between (1) the system status panel controller (SSPC) and (2) office alarm circuits and various system peripheral frames as needed. It also contains a part of the power-sequencing logic for the SSPC +3 volt A8 converters. In addition, this unit is an access point for all alarm and alarm test leads leaving or entering the No. 2B or No. 3 ESS maintenance frame.

2.02 When switch S1 is operated, contact 6 on the SSP provides a ground path to terminal 1L of the A relay via lead A6, contact 6B of the B relay, and contact 5M of relay AB24. Application of -48 volts direct current to terminal 1U of the A relay via resistor R2 and contact 4M of the AB24 relay causes the A relay to operate. When the A relay operates, +24 volts direct current is applied via output lead A10F to the start terminal of the +3 volt dc A8 converters, located in the maintenance frame power unit. The application of +24 volts direct current to the converter start leads enables the +3 volt output of the converter. However, the +3 volt dc output to the SSPC circuit is accomplished over a period of several hundred milliseconds. Consequently, the B relay operation provides a means to ensure a known initial state of certain

SSPC circuits when the +3 volts is stable. An open circuit appearing on lead PWUPI1 blocks all SSPC I/O operations, resets I/O control states, and clears all key memory flip-flops. A ground on lead PWUPI0 blocks the SSPC force-active function and MRF (system initialization) at the logic output stages. The following conditions will cause leads PWUPI1 and PWUPI0 to be active:

- (a) Relay A unoperated
- (b) Relay B unoperated
- (c) Release of normally operated MJO relay in the maintenance frame power unit.

2.03 With +24 volts direct current applied to the B relay through resistor R6, the B relay may be operated when lead O18 is grounded. Lead O18 is grounded only after relay-driver transistor Q1.18, located on FC209 in the SSC, turns on. Transistor Q1.18 turns on only when the system status panel (SSP) RC circuit connected to the input has been sufficiently charged by +3 volts direct current. This ensures a sufficient voltage to maintain the circuits at the required state when the B relay operates and disables the PWUPI1 and PWUPI0 leads. Also, when the B relay operates, the ground operate path to the A relay is switched from contact 6B to contact 6M of the B relay, thus bypassing switch S1 on the SSP. The latter feature enables the power-sequencing process to be reversed for removing +3 volts direct current to the SSPC.

2.04 When +3 volt dc power is removed from the SSPC, contact 1 of switch S1 provides a ground path through 60 ohms of resistance. Presence of the ground path causes the B relay driver to turn off. This causes the B relay to release, thus initializing all SSPC key memory circuits and blocking all I/O functions in the SSPC. Releasing the B relay also removes ground from the A relay, since SSP switch S1 is not operated and B relay contact 6M is open. Release of the A relay turns off the A8 converter and removes +3 volts direct current from the SSPC circuit.

3. ALTERNATE-BUS SWITCHING

3.01 An alternate-bus switching arrangement is provided for the SSP and SSPC circuits. The switching arrangement automatically attempts to switch from the primary A power buses (+24 volt dc A bus and -48 volt dc A bus) to the alternate B power buses when loss of bus power occurs. The +24 volt dc A bus is monitored by relay AB24 and the -48 volt dc A bus is monitored by relay AB48, with both relays held normally operated.

3.02 The AB24 relay (terminal 1L) is powered via input +24AAPA through resistor R15 from fuse AAAA, located on the maintenance frame power unit. The ground return is provided through relay AB48 contact 9M of relay AB48 to the AB24 relay terminal 2L. With this configuration, +24 volt dc power is distributed to the maintenance frame power unit via outputs AB242F and AB243F through relay contacts 2M and 3M, respectively. Loss of either the +24 volt dc A bus power or the ground return will release the AB24 relay. The +24 volt dc power to the maintenance frame power unit, which was delivered through the AB24 relay contacts 2R and 3B, is now obtained from B bus fuse AA0R.

3.03 The AB48 relay operate path is essentially the same as for the AB24 relay, except the ground return for operation is through the alternate-bus switch located on the SSP, via input AB48S1. The -48 volt dc power is obtained through fuses A0A or A0B in the maintenance frame power unit, with the output via leads AB4810F and AB4811F through AB48 relay contacts 10 and 11, respectively.

3.04 Whenever the AB48 relay releases (switches from primary A bus to secondary B bus), the AB24 relay also releases. However, the release of the AB24 relay does not have a similar effect on the AB48 relay. The reason for this difference is that the momentary loss of either the +24 volt or -48 volt source to an A8 power converter could cause a converter shutdown. Removal and reapplication of the +24 volt dc source to the converter +24VST input will initialize the converter to the power on state. The switching of the AB24 relay from one bus to another provides the required sequencing to the converter +24VST input.

3.05 Since the +3 volt dc direct current to the SSPC is turned off and then on again when a bus switch occurs, the SSPC logic must be sequentially initialized the same way as during a normal circuit power initialization sequence. For example, an alternate-bus test is performed by depressing the alternate-bus key (S3) on the SSP, causing relay AB48 to release. The release of relay AB48 opens the ground return to relay AB24, causing it to release. Consequently, AB24 relay transfer contacts 4 and 5 switch the power and ground sources to the A relay. Reversing the voltage polarity across the A relay causes it to release for several milliseconds and then reoperate. The reoperate time is delayed by an RC network comprised of resistor R3 and capacitor C1.

3.06 During the time the A relay is released, contact 8B of the A relay provides a ground to B relay driver Q1.18 in the SSPC. The B relay releases and remains released until after the A relay

has reoperated and +3 volts direct current is restored. Thus the initialization leads FKUP10 and FKUP11 are active from the moment the A relay releases until the B relay is reoperated, ensuring correct initialization states after an alternate-bus switch. When the alternate-bus key is released at the SSP, the process is reversed. Relay AB48 operates, then relay AB24 operates. The A and B relays release and then reoperate as previously described, except that the RC time constant which is used to delay the A relay operate time is now comprised of resistor R4 and capacitor C2.

4. ADDITIONAL COMPONENTS (FS 1)

4.01 Various contacts and components shown on FS 1 perform tasks which are not pertinent to the preceding functional descriptions. In general all networks are used as aids in noise suppression. Resistors in series with coils reduce the switching current to the relay drivers and thus reduce the noise coupling. Capacitor C4 is intended to maintain the AB24 relay operated when an SSPR short circuit fault occurs for a period sufficient to ensure that overload long enough for the power fuses blow before the relay switches to the alternate power bus. Resistors R8 and R9 provide short-circuit protection for power and ground returns to an external ferrod that monitors the SSP circuit power switch via leads PA and PB. Resistors R10 and R11 also provide for short-circuit protection.

4.02 Contacts 1M of relay AB24 and 12M of relay AB48 are used to indicate to the SSPC that a power bus switch has occurred. Contact 4M of the A relay causes a major power alarm (releases M30 relay) when the A relay is released and the SSP circuit power switch (S1) is on. Contact 7M of the A relay provides a reset signal for SSP related alarm circuits located in the maintenance frame power unit when the A relay is released. Contacts 10M and 12M of the B relay provide ground returns for external displays that indicate when the circuit power is on.

5. ADDITIONAL COMPONENTS (FS 2)

5.01 Shown on FS 2 are the relay buffer circuits between the SSPC and the office alarm circuits or other peripheral units as required. With the exception of the PF relay, all of the relays shown are software-controlled. A memory flip-flop in the SSPC is set, which in turn operates the relays via a relay driver. The input leads from the relay drivers in the SSPC are odd numbered between O1 and O17 plus O21 and O22. Each relay has contacts wired to an access terminal block on the relay unit. The terminal block serves as a central access point for wire-wrap connections leaving the maintenance frame (see SD lead mnemonics for brief functional

explanations). Leads other than those originating in the relay unit are wired to the access terminal strip (eg, alarm leads from maintenance frame power unit) for centralization purposes. These connections also appear on the maintenance frame drawing for interframe wiring information purposes.

5.02 The PF relay acts as a buffer from peripheral switches to the test control execute bit located in the SSPC. When a switch connected to the PF relay coil is operated, the PF relay operates. During operation of the PF relay, ground is removed from lead KR05100 via contact 8B before being applied to lead KR05110 via contact 8M. Release of the PF relay causes the process to be reversed; that is, ground is removed from lead KR05110 when contact 8M releases before being applied to lead KR05100 when contact 8B closes. As a result, the memory flip-flop in the SSPC changes state once for each operation of the PF relay. The release of the PF relay primes the SSPC flip-flop for the next operation.

5.03 All of the relays shown on FS 2 are AF10 types, requiring a minimum of 7.2 mA through the 2500-ohm (nominal) coil to operate. The diodes placed across the coils minimize the voltage induced by the collapsing magnetic field of the relay coil when the relay driver is turned off. Lead AB242F supplies the +24 volts direct current to operate each relay.

SECTION III - REFERENCE DATA

1. WORKING LIMITS

1.01 None.

2. FUNCTIONAL DESIGNATION

2.01 Diodes

<u>Designation</u>	<u>Meaning</u>
CR1-CR12	Clamps the associated relay driver source lead to a maximum battery level which must not exceed the breakdown voltage of the driving transistor when a relay is released.

2.02 Relays

<u>Designation</u>	<u>Meaning</u>
A	Part of SSPC power sequencing circuits.
AB24	Alternate bus relay switch for +24 volts direct current. Switches from primary

<u>Designation</u>	<u>Meaning</u>	<u>Designation</u>	<u>Meaning</u>
	A bus power to secondary B bus power if loss of A battery source occurs.	MN-PWR	Indicates a minor power trouble.
AB48	Alternate bus relay switch for -48 volts direct current. Switches from primary A bus power to secondary B bus power if loss of A battery source occurs.	PAIR	Provides an indication that a requested system test has passed.
		PF	Provides a buffer from various switches to the SSPC memory flip-flop which initiates the execution of a requested test.
ALM-EATT	Indicates a central office (CO) or system alarm circuit trouble.	<u>3. FUNCTIONS</u>	
ALM-XFER	Indicates local CO alarms may be partially circumvented.	3.01 Provides relay buffers between the SSPC and circuits located on other frames in a central office.	
B	Part of SSPC power sequencing circuits.	3.02 Provides power sequencing of the SSPC +3 volt A8 converters by the A and B relays appearing in this unit.	
BLCG-ALM	Provides relay buffer control for selected CO alarm circuits.	<u>4. CONNECTING CIRCUITS</u>	
CRIT	Indicates the existence of a critical alarm condition pertaining to the 3A CC control complex or peripheral units.	4.01 When this circuit is listed on a keysheet, the connecting information thereon should be followed.	
EL-XFER	Provides control contacts for emergency line switching in a CO.	(a) System Status Panel (SSP) - SD-1C906-01.	
FAIL	Provides an indication that a requested system test has failed.	(b) System Status Panel Controller (SSPC) - SD-1C907-A1.	
MAJOF	Indicates the existence of a major alarm condition pertaining to the 3A CC control complex or peripheral units.	(c) Maintenance Frame Power Unit - SD-1C909-01.	
MINOF	Indicates the existence of a minor alarm condition pertaining to the 3A CC control complex or peripheral units.	(d) Maintenance Frame Circuit - SD-1C912-01.	
MJ-PWR	Indicates a major power trouble.	<u>5. MANUFACTURING TESTING REQUIREMENTS</u>	
		5.01 Manufacturing testing requirements are specified in the X-78890 specification.	
		<u>SECTION IV - REASONS FOR REISSUE</u>	
		<u>D. Description of Changes</u>	
		D.1 Substituted coax-shielded cable for a single-wire (net B8) connection between two relays.	
		D.2 Provided a zero-active circuit power indication to the E2A telemetry for SCC applications.	

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